

**ANALYSIS AND MANAGEMENT IMPLICATIONS OF LONG-TERM TROUT POPULATION MONITORING ON
THE BITTERROOT RIVER AND LOWER WEST FORK BITTERROOT RIVER, WESTERN MONTANA**



PREPARED BY:

JASON LINDSTROM, FISHERIES BIOLOGIST MONTANA FISH, WILDLIFE AND PARKS

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BACKGROUND

The Bitterroot River and West Fork Bitterroot River below Painted Rocks Dam are two very popular trout fisheries in Western Montana. Together these streams support some of the highest angling pressure recorded in the state and also see the most angler days of any river system in FWP administrative Region 2. Annual pressure estimates from statewide angler surveys indicate that the Bitterroot River together with the lower West Fork routinely exceed 100,000 angler days per year.

The trout fishery of the Bitterroot River is comprised of a combination of native and introduced species. The upper Bitterroot and West Fork are strongholds for native westslope cutthroat trout, with this species contributing to much of the angler catch in this part of the drainage. Non-native rainbow trout and brown trout are the primary species available to anglers in the lower reaches of the Bitterroot downstream of Hamilton but are also found throughout the upper Bitterroot River and lower West Fork in good numbers. Brook trout are common in many Bitterroot tributary streams, but tend to be rare in the mainstem river. Native bull trout, despite significant declines in abundance, can still be found in the upper Bitterroot River and the West Fork. The Bitterroot River and the West Fork are listed as Critical Habitat for bull trout by the U.S. Fish and Wildlife Service (USFWS 2010) and are also within the Columbia Headwaters Recovery Unit (USFWS 2015).

The Bitterroot River is managed as a wild trout fishery, emphasizing natural reproduction of native and non-native trout. Due to increasing fishing pressure and observed declines in some fish species, fishing regulations became more restrictive in the Bitterroot River and the West Fork around 1990. Native westslope cutthroat trout, which were susceptible to high angling harvest during this time were protected under catch-and-release regulations throughout the Bitterroot River and the upper forks. Additionally, native bull trout gained Federal protections under the Endangered Species Act when the species was listed as "Threatened" in 1998. Catch-and-release regulations were also implemented for rainbow trout in the upper forks of the Bitterroot due to the impacts of whirling disease in these areas.

Currently one catch-and-release section for all trout species exists on the Bitterroot River. This section runs between the Florence Bridge FAS near Florence upstream to the Woodside Bridge FAS near Corvallis. In addition to being catch-and-release for all trout, this reach also limits tackle to artificial lures only. The remainder of the Bitterroot River and lower West Fork are open to the use of bait.

Fish population monitoring provides valuable information to inform management strategies to maximize angling opportunity while maintaining the quality of the fishery and protecting native species. Electrofishing population estimate data has been collected in the Bitterroot drainage at a number of established reaches since the late 1980's or early 1990's. Study reaches were selected based on historical data, streamflow patterns and fishing regulations. Currently three long-term sections are monitored for trout abundance on the Bitterroot River, as well as one on the lower West Fork. The reaches vary from 2.9 to 5.0 miles in length. The sections on the Bitterroot River are located near Stevensville, Hamilton, and Darby (Hannon). The section on the West Fork is located near Conner. Prior to 2019, electrofishing estimates were completed at these sections every four to five years. Currently, sampling frequency has been increased to every other year.

The primary objective of this report is to provide and discuss long-term trends in trout abundance, size structure, angler pressure, and angler habits on the Bitterroot River and lower West Fork to inform management direction in the 2023-2027 Statewide Fisheries Management Plan. This report describes trends in westslope cutthroat trout, rainbow trout, and brown trout abundance and size structure at three long-term monitoring locations on the Bitterroot River and one on the lower West Fork. Bull trout and brook trout are captured infrequently in mainstem surveys, which precludes precise estimates. Therefore, these species are not included in this report.

METHODS

Population estimates provided in this report were obtained using standard electrofishing and mark-recapture methods. Sampling was completed on the Bitterroot River and lower West Fork using a drift boat mounted, fixed anode (boom) electrofishing system with all sampling conducted in the fall (September and October). The electricity used for electrofishing was created by a 5000-watt generator and the wave form was controlled using a Smith Root VVP 15B rectifying unit. Smooth direct current was used at all times. Crews consisted of two or three people, one controlling the boat and the other(s) standing in the bow capturing fish with a dip net. Typically, estimates were generated using three marking passes completed over approximately a one-week period, and two recapture passes completed about one week later. The best available habitat across the cross-section of the channel was selected for electrofishing to maximize the number of fish sampled.

All fish captured during the sampling efforts were identified to species based on phenotypic characteristic, measured for total length (TL), weighed, examined for obvious hooking scars, given a small identifiable fin clip (if on a marking run), and then released. Multiple stops were made through each section to assure adequate redistribution of fish throughout the sample reach. Sampling personnel differentiated westslope cutthroat trout from rainbow trout and hybrids based on phenotypic characteristics (e.g., slash and spotting patterns). Hybrid trout were included in the Rainbow Trout abundance estimates. Population estimates were calculated for fish 175 mm (~7") and greater TL and were calculated using a modified Peterson estimator (Bailey 1951).

Angling pressure data was obtained from FWP reports that summarized angler survey data. These reports were typically produced every other year and are available at: <https://fwp.mt.gov/fish/pressure-surveys>.

RESULTS & DISCUSSION

POPULATION MONITORING

West Fork Bitterroot River @ Conner

Total trout abundance in the lower West Fork Bitterroot River has been relatively stable over the last two decades, although some periodic variability exists among species (Figure 1). The most recent population estimates collected in 2022 indicate that overall trout numbers are a little below the long-term average, but within the range of variability observed for each species for the period of record. Westslope cutthroat trout tend to be the most abundant species in the lower West Fork followed by rainbow trout and brown trout, respectively. Despite the below average estimate collected in 2022, there has been a clear positive trend in westslope cutthroat trout abundance at the Conner Section since sampling was initiated in 1986 (Appendix A). The increase is primarily due to harvest restrictions enacted in 1990. Rainbow Trout numbers at the Conner Section were highest in the mid-to-late 1990s but declined in the early 2000s. Rainbow trout have remained at a stable population level and size structure over the last two decades (Appendix A). Brown trout were present in relatively low numbers when the Conner Section was first sampled in 1986 but began increasing in abundance throughout the 2000s (Appendix A). The population has been relatively stable over the last two decades although the most recent estimate collected in 2022 shows a slight decline in abundance and is more comparable to numbers observed in the 1980s and 1990s. Brown trout size structure in the lower West Fork has been relatively stable throughout the period of record, with minor variation largely attributed to natural abundance changes.

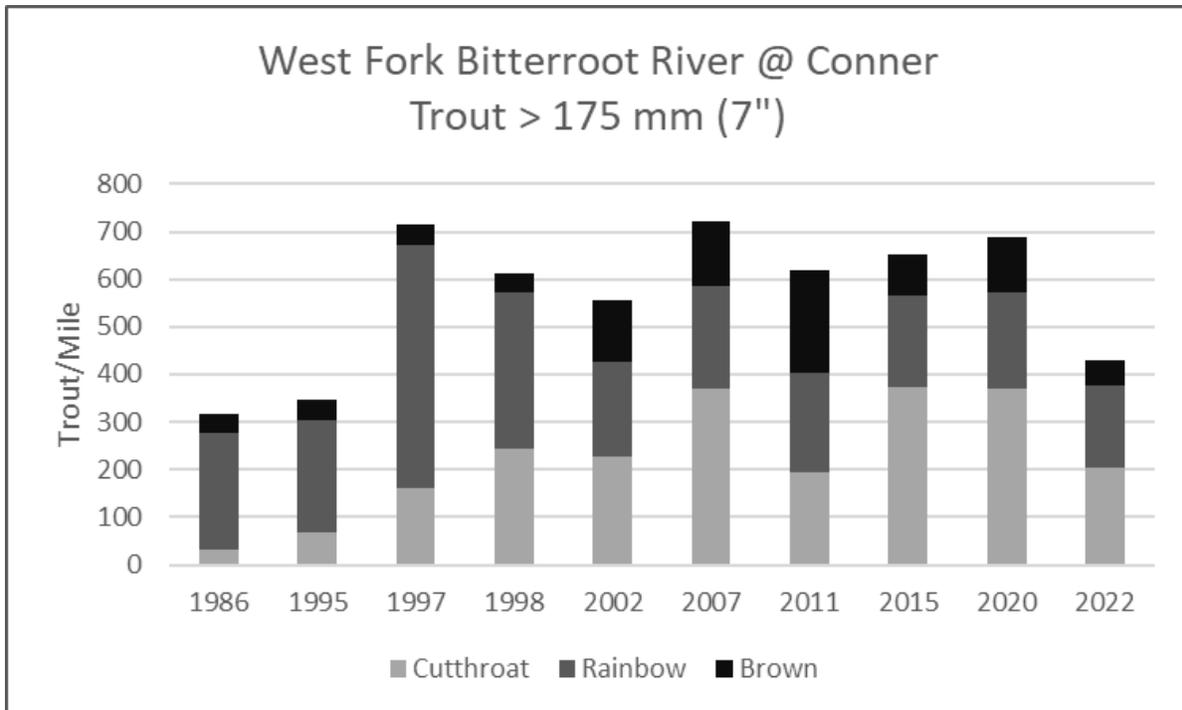


Figure 1. Trout abundance in the West Fork Bitterroot River at the Conner Section for the period of record.

Bitterroot River @ Hannon

Total trout abundance in the upper Bitterroot River has generally shown an increasing trend since sampling was initiated at the Hannon Section in 1989 (Figure 2). Westslope cutthroat trout showed a strong, positive response to harvest restrictions put in place in 1990 but have been on a declining trend over the last decade. Despite this, the most recent estimate collected in 2021 was still above the long-term average. Rainbow trout densities were highest in the upper Bitterroot in the early 1990s but declined in the early 2000s related to the discovery of whirling disease in the upper Bitterroot drainage around the same time (Clancy 2003). Since the initial decline, rainbow trout have been on a slight increasing trend over the last two decades (Appendix A). The most recent population estimate collected in 2021 indicates that rainbow trout numbers in the Hannon Section are near the long-term average for the period of record. Brown trout were present in relatively low numbers in the upper Bitterroot when the Hannon Section was first sampled in 1989 but began steadily increasing in abundance throughout the 2000s (Appendix A). The population continued to increase until around 2013 and remained stable through the 2018 population survey. However, the most recent estimate collected in 2021 suggests that the population may have declined to below the long-term average. It is possible that recent drought conditions throughout the region may be associated with these declines. The proportion of brown trout greater than 305 mm (12") TL declined as density increased in the 2000s, but has been relatively stable since around 2006 (Appendix A)

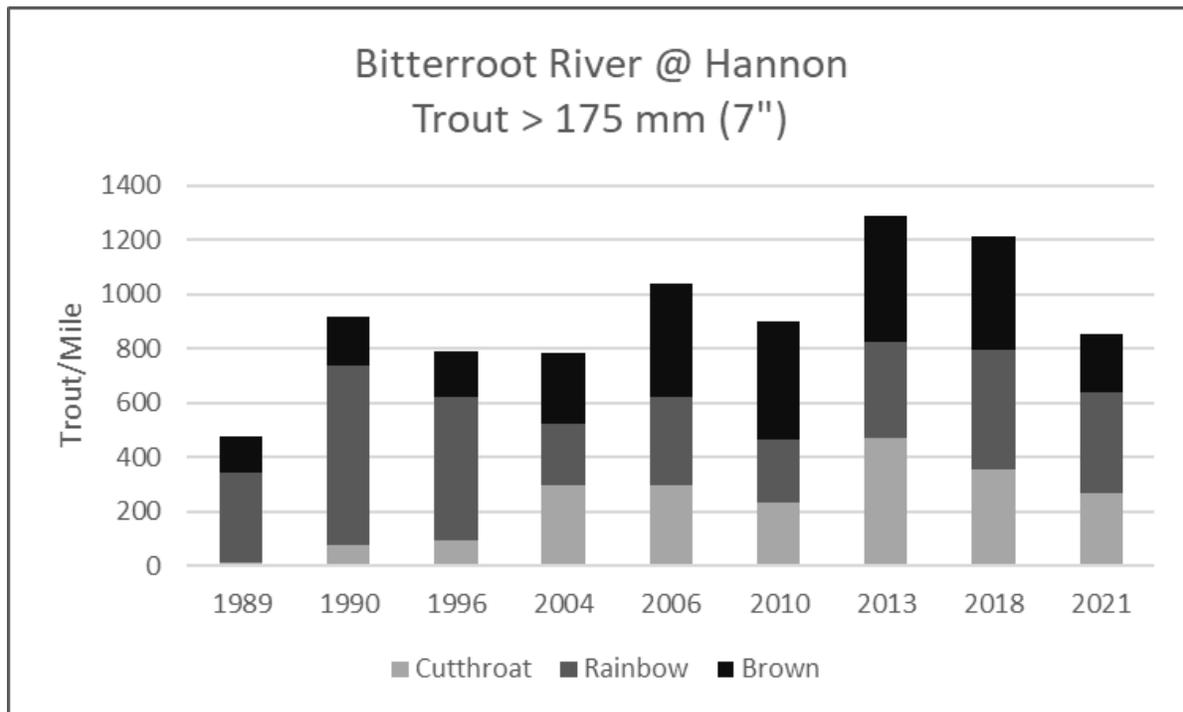


Figure 2. Trout abundance in the upper Bitterroot River at the Hannon Section for the period of record.

Bitterroot River @ Hamilton

Total trout abundance in the Bitterroot River near Hamilton has been relatively stable over the last two decades, although some periodic variability exists among species (Figure 3). Westslope cutthroat trout have been present at relatively low densities in the Hamilton Section since it was first sampled in 1991. In most years there were not enough cutthroat handled to obtain a precise estimate. When an estimate was generated, it was always below 50 fish per mile (Appendix A). Rainbow trout dominate the trout fishery in the Bitterroot River at the Hamilton Section. While there has been variability in population densities over that last three decades, the overall trend has been relatively stable (Appendix A). The most recent estimate collected in 2021 was a little below the long-term average, but within the range of variability previously observed. Brown trout have been present in fairly low numbers in the Bitterroot River at Hamilton over the last 30 years. Population number and size structure have remained relatively stable throughout this time (Appendix A).

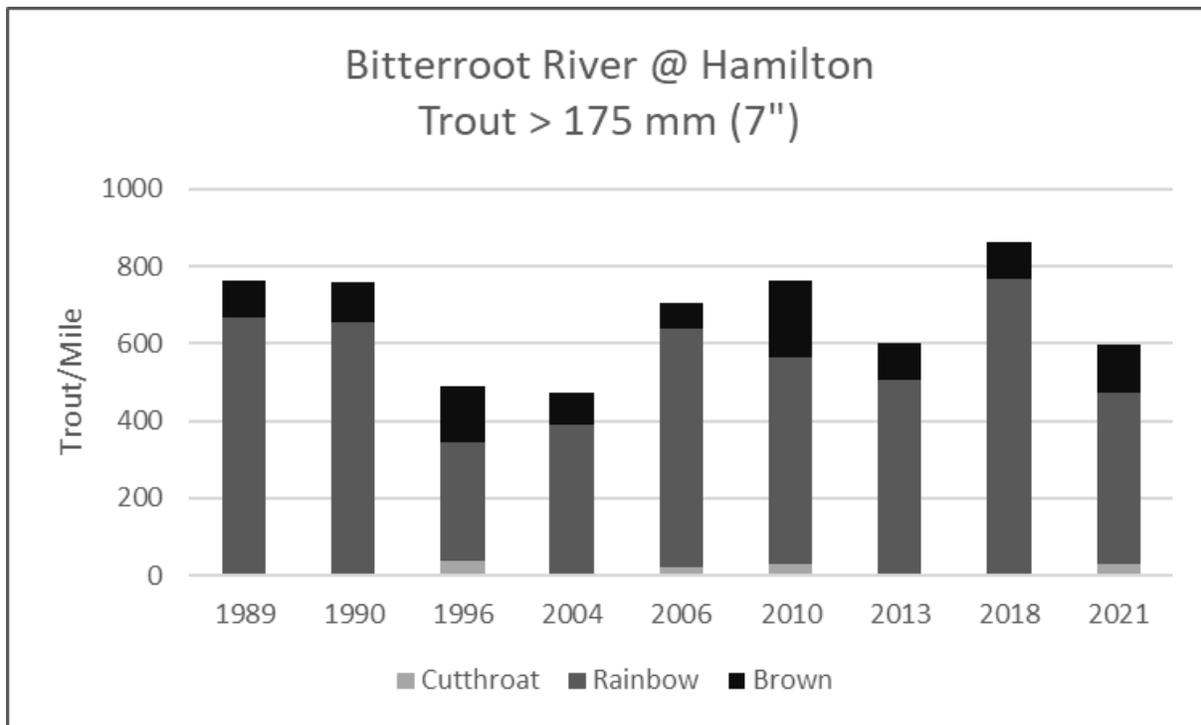


Figure 3. Trout abundance in the Bitterroot River at the Hamilton Section for the period of record.

Bitterroot River @ Stevensville

Total trout abundance in the Bitterroot River near Stevensville has been on a slight increasing trend since the section was first sampled in 1989 (Figure 4). However, the most recent samples from the last several years indicate that trout density may be in decline. It is important to mention that the Stevensville Section falls within the catch-and-release and artificial lures only section on the Bitterroot River. Angler harvest of fish should not be a factor driving population trends in this monitoring section. Westslope cutthroat trout are rare in this part of the Bitterroot River, and precise estimates of abundance have not been possible. Rainbow trout dominate the trout fishery at the Stevensville Section, and while there has been variability in population densities over that last three decades, the overall trend has been increasing (Appendix A). However, the most recent estimates collected in 2020 and 2022 show a declining trend, with the 2022 estimate being the lowest on record, albeit not substantially. Causes of this decline are not completely understood but are likely related to recent drought conditions the region has endured over the last several years. Brown trout have been present in relatively low numbers in the Bitterroot River at Stevensville over the last 30 years. Population number and size structure have remained relatively stable throughout this time, with densities tending to be under 100 fish per mile and over half the fish sampled being over 305 mm (12") in TL (Appendix A).

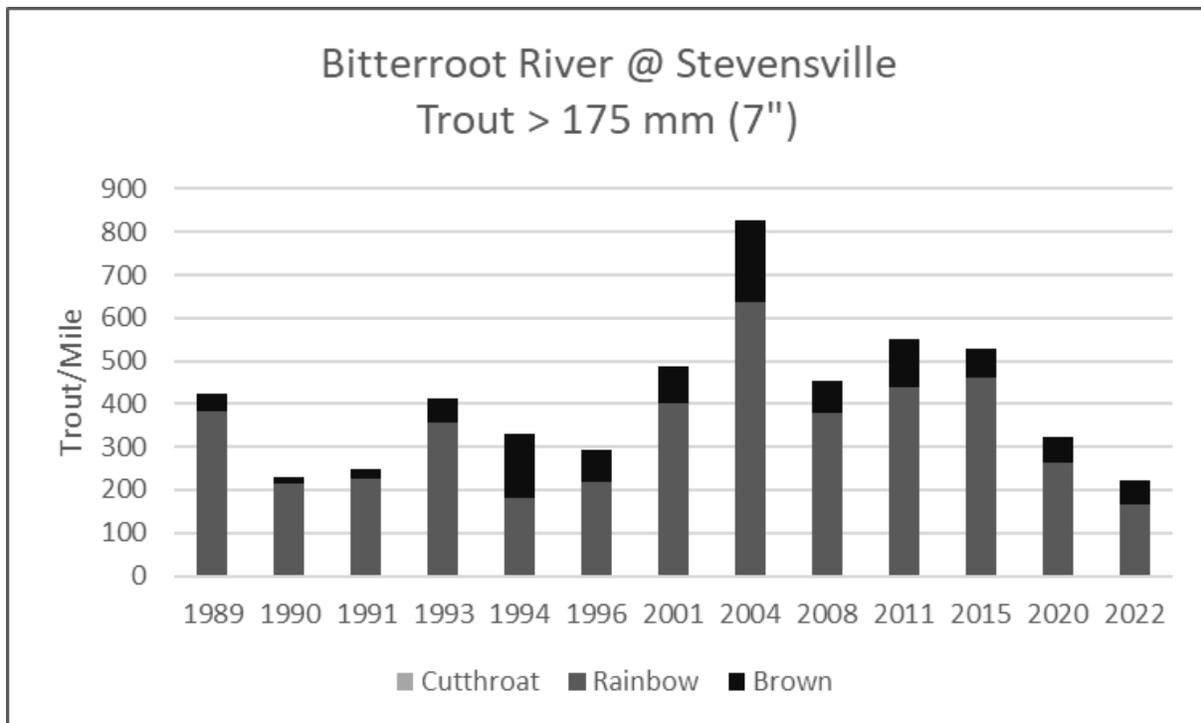


Figure 4. Trout abundance in the Bitterroot River at the Stevensville Section for the period of record.

ANGLER PRESSURE & USE PATTERNS

Angling pressure has increased significantly in the Bitterroot drainage since 1989 (Figure 5). Total annual fishing pressure on the Bitterroot River and the West Fork increased from 45,227 angler days per year in 1989 to 157,494 angler day per year in 2020. Much of the pressure is focused on the upper Bitterroot River where native westslope cutthroat trout are most abundant and make up a high proportion of the catch. Public concerns over the health of the fishery in the midst of unprecedented angling pressure have grown in recent years.

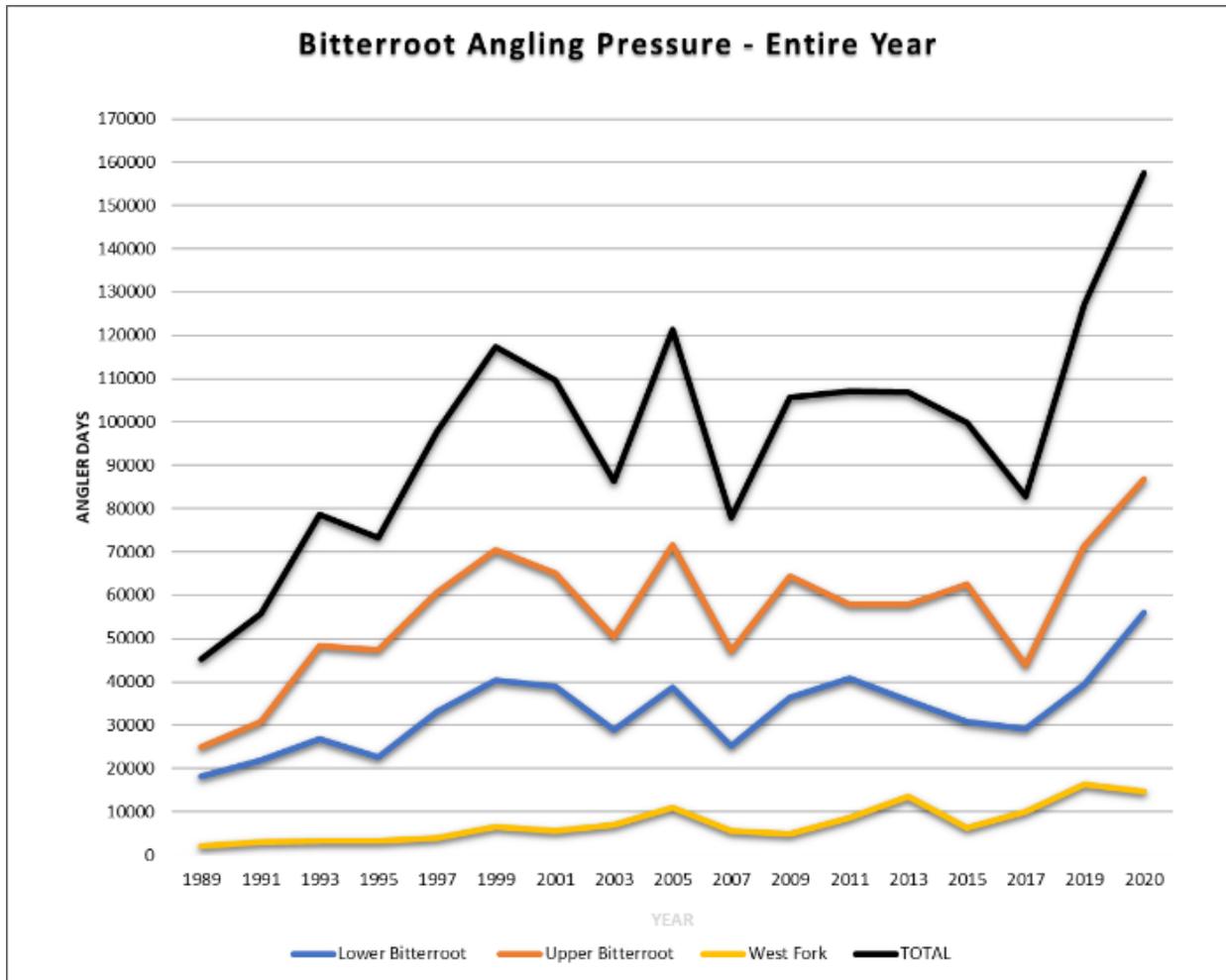


Figure 5. Total year angler pressure expressed in angler days in the Bitterroot River and West Fork from 1989 to 2020.

Westslope cutthroat trout provide a useful index to the overall health of the fishery because they are the most likely to be impacted by angling due to their susceptibility and vulnerability to capture compared to other trout species. In the upper Bitterroot and lower West Fork, westslope cutthroat trout abundance has generally increased while angling pressure has also increased. However, within the last five years at both long-term sites (Bitterroot @ Hannon and West Fork @ Conner) declining trends in westslope cutthroat trout abundance have been observed. It is possible that this is related to drought

conditions that have impacted the region during this time period, resulting in depressed recruitment. However, it is also possible that record angling pressure and high catchability of westslope cutthroat trout could potentially be having an impact as well. This impact would be related to post-release mortality since harvest of fish should not be a factor as cutthroat are protected under a catch-and-release regulation.

In addition to angling pressure surveys, hook scar rates are another way to evaluate angling pressure on a given species in fisheries dominated or regulated by catch-and-release fishing. In the upper Bitterroot and lower West Fork, hook scar rates were evaluated by species through time to determine if catch-and-release angling pressure may be increasing. Presumably, if increased angling pressure contributed to excessive mortality, it could manifest as overharvest and result in depressed or declining fish populations. However, caution should be taken in this evaluation as there are other factors that may be contributing to declining fish populations such as drought effects. In general, hook scar rates on Westslope cutthroat trout have been increasing in the lower West Fork (Figure 6), and in the upper Bitterroot (Figure 7) over the last decade. The most recent hook scar rate on westslope cutthroat trout at the Conner Section on the West Fork was the highest ever recorded at just under 70%. This indicates that a very high proportion of the westslope cutthroat trout population in the upper Bitterroot and lower West Fork is being caught by anglers. In contrast, the hook scar rate for rainbow trout at the Conner Section in 2022 was 27% (also a record high, long-term average is 15%), and just 5% for brown trout. Differences in hook scar rates between trout species reflects their relative susceptibility to angling, and if harvest by anglers is common, the relative effectiveness of harvest restrictions in managing their population. At this time there is no indication that the lower angler encounter rates observed in rainbow trout and brown trout are having any sort of population impact on these species.

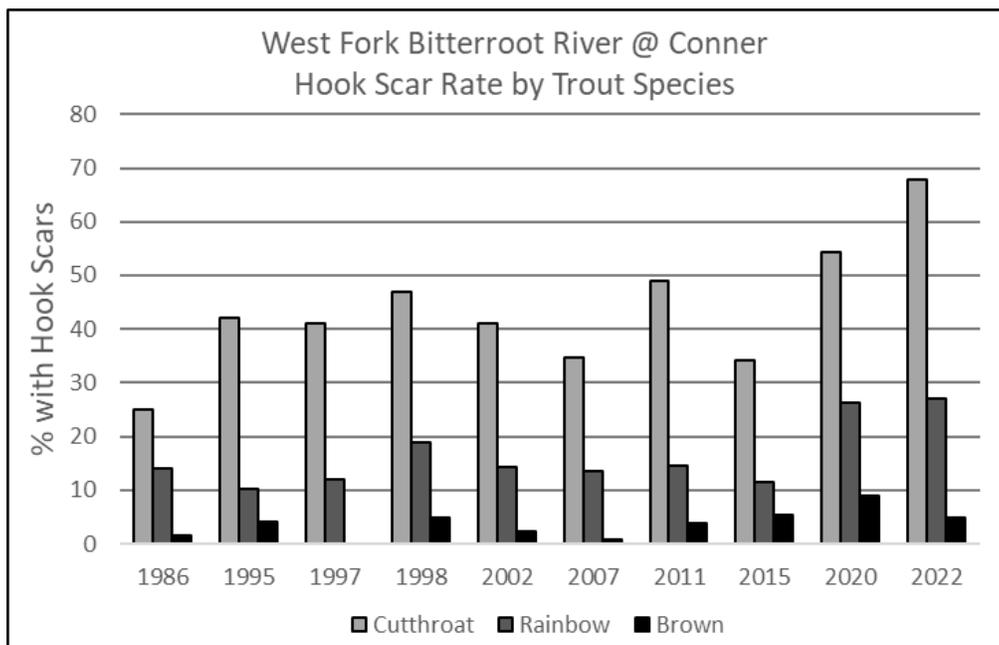


Figure 6. Hook scar rates by trout species in the West Fork Bitterroot River at Conner from 1986 to 2022

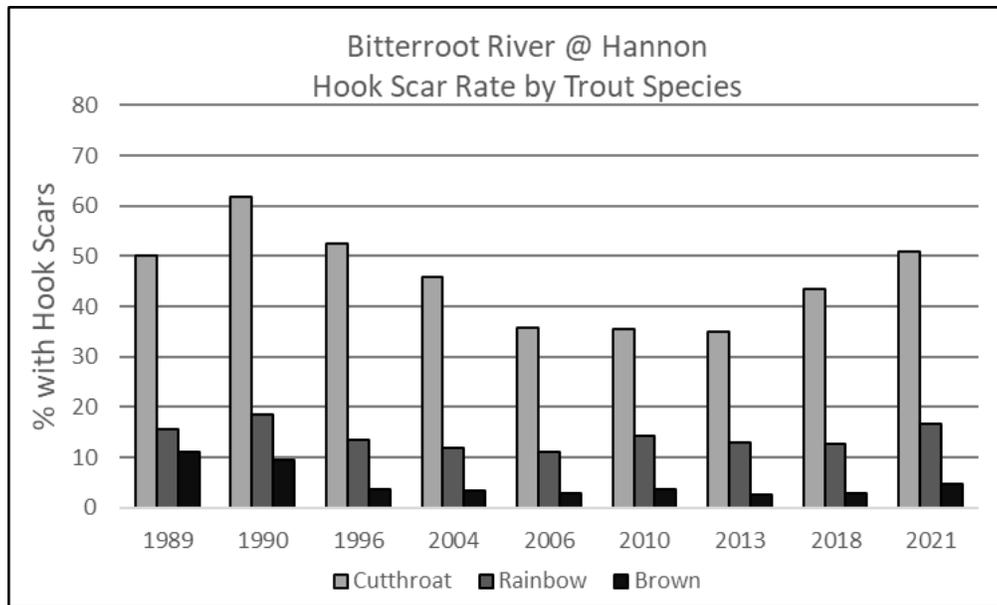


Figure 7. Hook scar rates by trout species in the Bitterroot River at Hannon from 1989 to 2021.

Numerous studies have indicated that catch and release angling mortality on trout is generally less than 5% (Schill and Scarpella 1997). However, little research has evaluated the effect of multiple captures and releases on the long-term survival of westslope cutthroat trout. In short, with such high encounter rates in the upper Bitterroot River and lower West Fork it is quite possible that westslope cutthroat trout are being caught and released multiple times, and sometimes over a short time span and/or when environmental conditions are stressful (i.e., elevated water temperatures related to drought). Further information on the impact of high angling pressure and catch-and-release related mortality on westslope cutthroat trout is needed.

Further downstream on the Bitterroot River at the Hamilton and Stevensville sections, hook scar rates over time have tended to be relatively low for nonnative rainbow trout and brown trout despite increasing angling pressure (Figures 8 and 9). With hook scar rates averaging around 10% for rainbow trout and approximately 5% for brown trout, there are no indications to suggest that increased angling pressure has resulted in excessive catch-and-release trout mortality in this part of the Bitterroot.

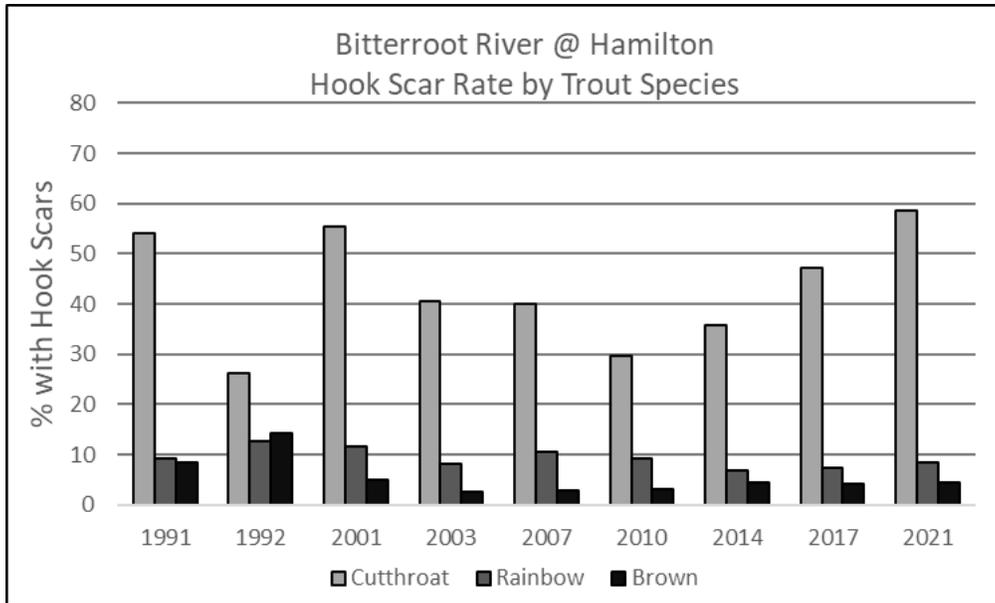


Figure 8. Hook scar rates by trout species in the Bitterroot River at Hamilton from 1991 to 2021.

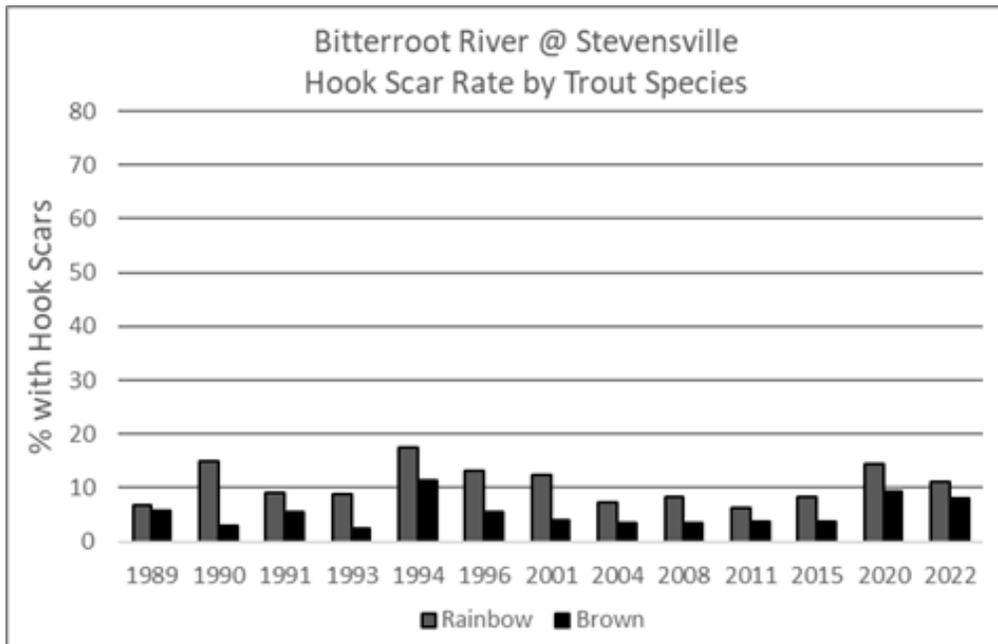


Figure 9. Hook scar rates by trout species in the Bitterroot River at Stevensville from 1989 to 2022.

In general, harvest of trout by anglers in the Bitterroot River and lower West Fork currently appears to be very low. While no recent creel surveys have been completed on the Bitterroot, few anglers contacted admit to keeping fish. Most of the anglers encountered are using fly fishing gear, with a small percentage using spinning gear with artificial lures. It is uncommon to encounter anglers in the field utilizing bait. Regional creel data from other rivers including the Blackfoot River and Rock Creek have demonstrated a pronounced shift in the recreational fishery from harvest-oriented bait fishing towards artificial lures with little harvest component (Liermann 2022, Uthe 2022). The use of spinning tackle has significantly decreased as well, creating a recreational fishery comprised primarily of fly anglers or anglers using both fly and spin tackle. Unpublished creel data from the West Fork of the Bitterroot River collected in conjunction with the 2016 senior thesis of Benjamin Rich suggests the following: *“Of my survey participants, 93.6% used fly gear as their primary gear type and of those anglers 71.7% voluntarily used barbless or debarbed hooks. Only anglers from three boats in the survey were primarily using spinning gear (6.4% of total).”* Given current gear trends and that harvest levels appear to be very low, current regulations that allow a wider variety of terminal tackle, and some trout harvest opportunities are consistent with managing the Bitterroot trout fishery at this time.

MANAGEMENT CONSIDERATIONS

Overall, long-term monitoring of the abundance and size structure of trout in the Bitterroot River and lower West Fork indicate that the current management strategy has been largely compatible with maintaining diverse fishing opportunities while maintaining the quality of the fishery and protecting native species. The current level of harvest appears to be very low and is not expected to be significant from a population-level standpoint. However, additional information on encounter rates and cumulative catch-and-release mortality of westslope cutthroat trout is needed to inform management strategies as the upper Bitterroot River and lower West Fork continue to experience unprecedented levels of angling pressure. Ongoing monitoring is essential to assessing population status and trends, especially as angler pressure is expected to continue increasing.

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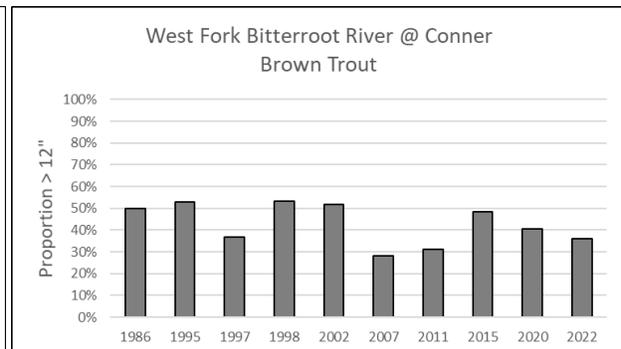
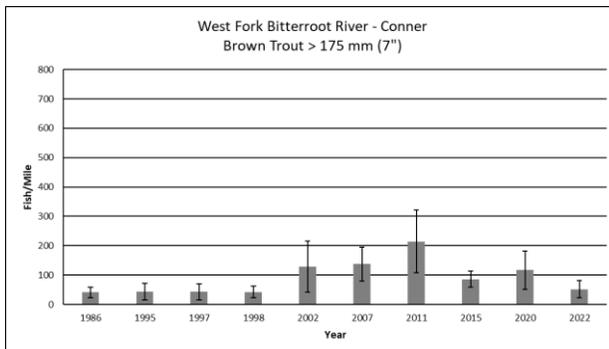
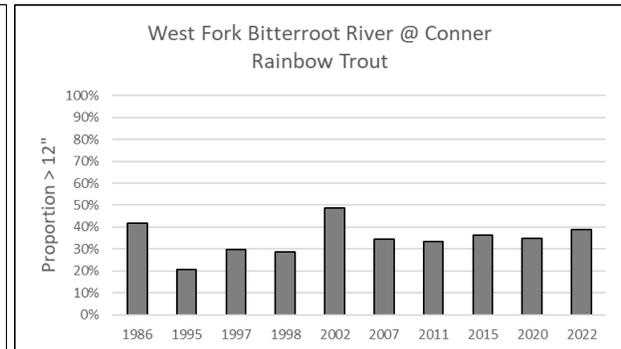
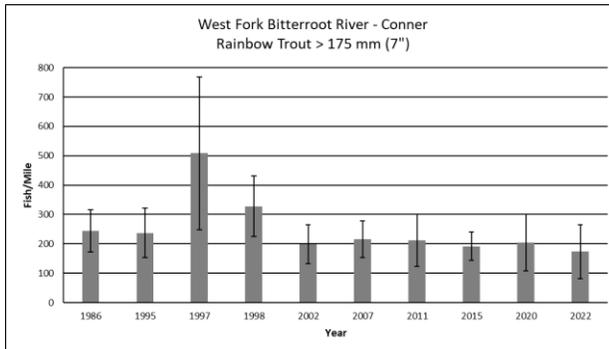
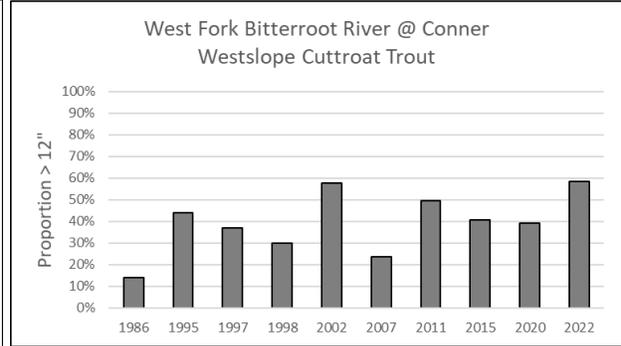
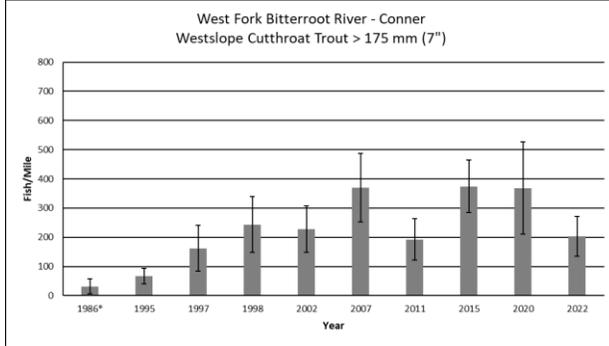
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Appendix A. Population estimates and size structure information by species for three long-term monitoring sections on the Bitterroot River and one on the lower West Fork Bitterroot River.

West Fork Bitterroot River @ Conner

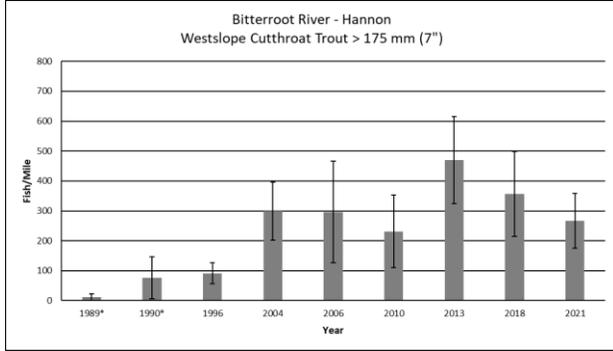
Population Estimates

Size Distribution

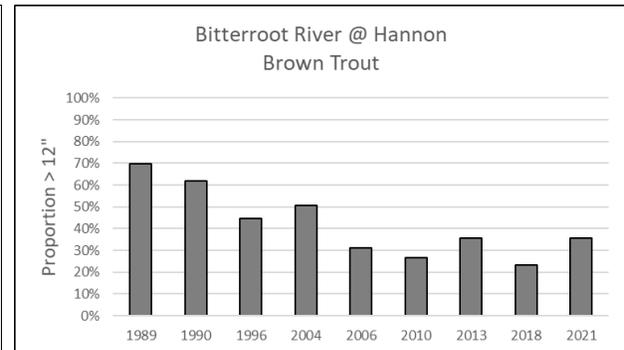
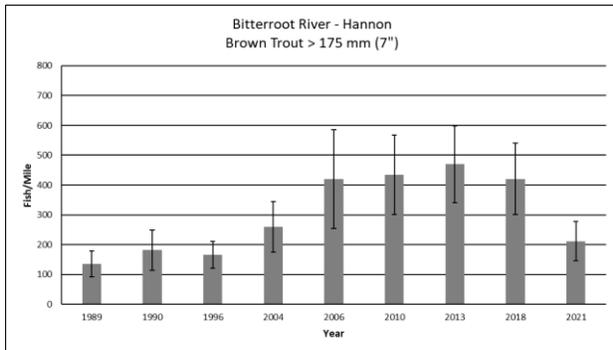
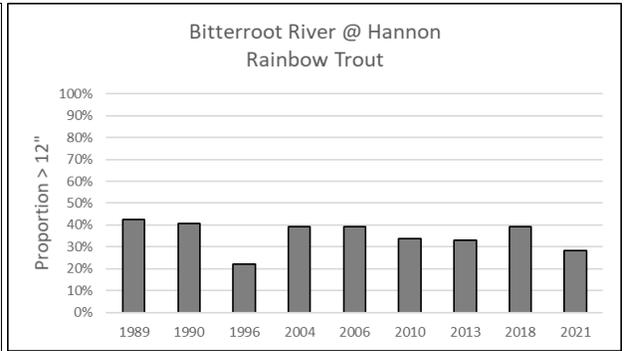
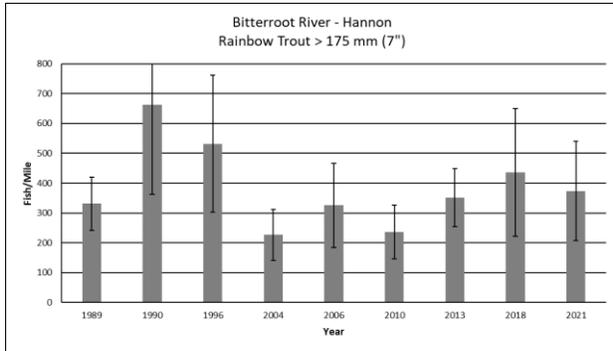
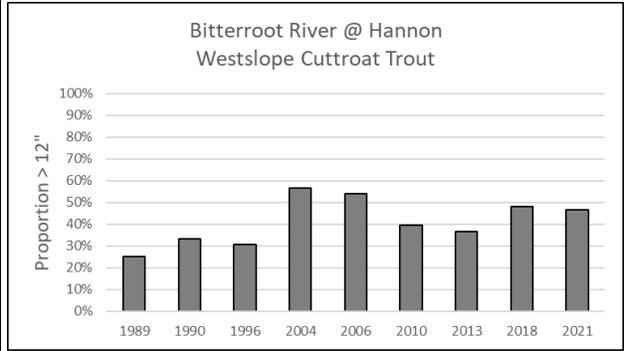


Bitterroot River @ Hannon

Population Estimates

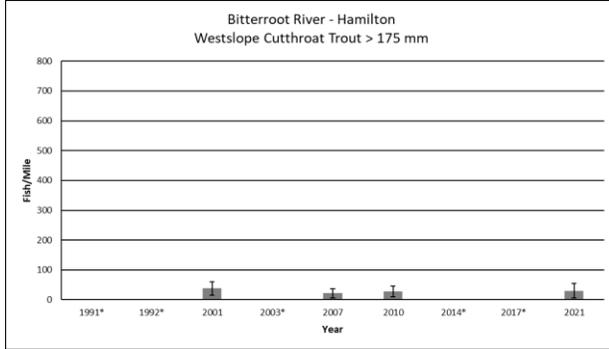


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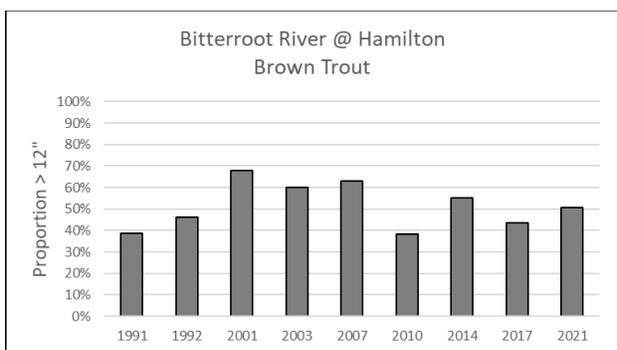
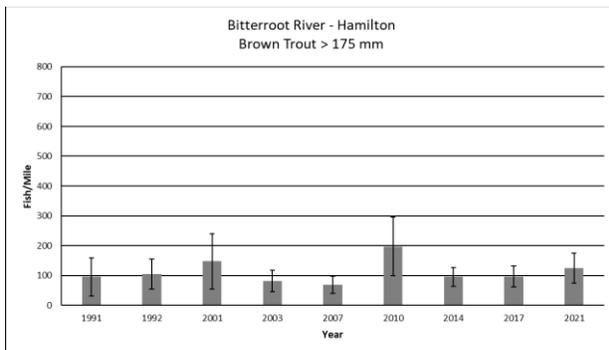
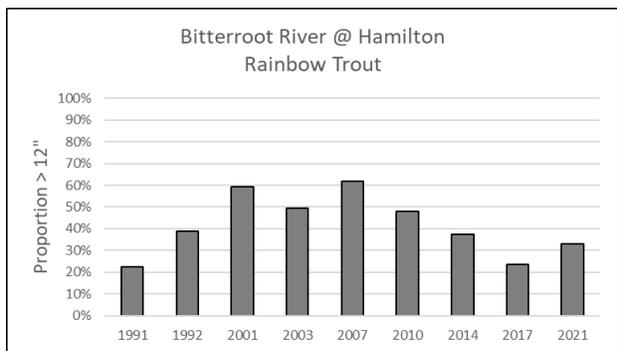
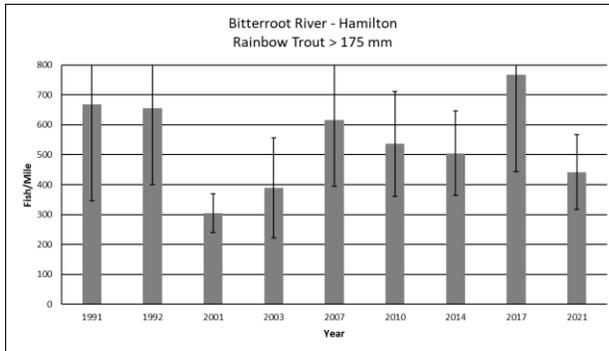
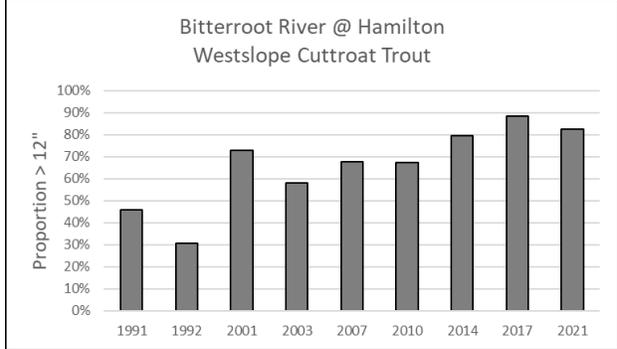


Bitterroot River @ Hamilton

Population Estimates

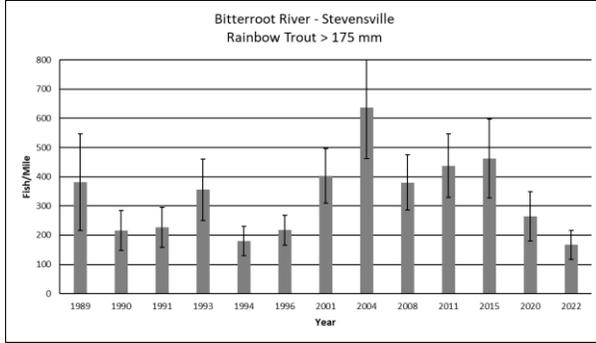


Size Distribution



Bitterroot River @ Stevensville

Population Estimates



Size Distribution

